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Abstract

FUEL LOADING AND UNLOADING DEVICES FOR THE FRENCH NATURAL URANIUM - GRAPHITE - GAS SEQUENCE REACTORS

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The refereling system is one of the vital parts of a natural uranium-graphite-gas sequence nuclear power plant.

From the costs standpoint, it involves 8 to 10 % of total capital expenditure, at the moment. From the technical standpoint, the question is complex, both as regards the tasks the equipment must fulfil and the high safety requirements.

In the first section of the paper, the various fundamental aspects of operation and safety are reviewed, enabling principles universally applicable to be brought out.

The authors then go on to analyse factors governing the basic choice and conclude by emphasising the value of actual operation so as to accumulate long operational experience.

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They then give a brief description of the equipment for EDF 2, EDF 3 and EDF 4 and show how the above principles have been applied to two solutions differing very widely technically :

- at EDF 2, several machines, each specialising in a given task ; preparing the standpipes, auxiliary operations, charging and discharging of the fuel elements into and from the reactor, and maintenance.
- at EDF 3 and EDF 4, a single machine carrying out all these tasks.

In both cases, the equipment is very heavy, owing to the very stringent safety standards adopted.

The report ends with a brief glimpse into cost factors and design and testing methods employed to develop these complex units, in particular, the equipment is tested under nominal pressure and temperature conditions before being sent on site at the Saint-Denis testing station. In addition, beakdown of the cost of the units brings out the relative importance of the design and testing item (about 35 %).

In their conclusions, the authors state that solutions found are very complex, but may be vastly improved upon.

The results of initial pressure and temperature tests justify consideration that the equipment will give every satisfaction, like that for G2 and G3, which were the world's first loading and unloading machines to operate under load.